

SEQUENCE LISTING

<110> Levy , Ilan

Shoseyov, Oded

Nussinovitch, Amos

<120> MODIFICATION OF POLYSACCHARIDE CONTAINING MATERIALS

<130> 00/20910

<140> 60/166,389 and 60/164,140

<141> 1999-11-18 and 1999-11-08

<160> 13

<170> PatentIn version 3.0

<210> 1

<211> 507

<212> DNA

<213> Clostridium cellulovorans

<400> 1

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atgacgtaaa agttagatat tattacacaa gtgatggtac acaaggacaa actttctggt    180
gtgaccatgc tggatgcatta ttaggaaata gctatggtga taacactagc aaagtgcag    240
caaaacttcgt taaagaaaca gcaagcccaa catcaaccta tgatacatat gttgaatttg    300
gatttgcaag cggacgagct actcttaaaa aaggacaatt tataactatt caaggaagaa    360
taacaaaatc agactggtca aactacactc aaacaaatga ctattcattt gatgcaagta    420
gttcaacacc agttgtaaat caaaagttta caggatatat aggtggagct aaagtacttg    480
gtacagcacc ataggatcca gatgtac                                         507
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<210> 2

<211> 163

<212> PRT

<213> Clostridium cellulovorans

<400> 2

Met Ala Ala Thr Ser Ser Met Ser Val Glu Phe Tyr Asn Ser Asn Lys

1 5 10 15

Ser Ala Gln Thr Asn Ser Ile Thr Pro Ile Ile Lys Ile Thr Asn Thr

20 25 30

Ser Asp Ser Asp Leu Asn Leu Asn Asp Val Lys Val Arg Tyr Tyr Tyr

35 40 45

Thr Ser Asp Gly Thr Gln Gly Gln Thr Phe Trp Cys Asp His Ala Gly
 50 55 60
 Ala Leu Leu Gly Asn Ser Tyr Val Asp Asn Thr Ser Lys Val Thr Ala
 65 70 75 80
 Asn Phe Val Lys Glu Thr Ala Ser Pro Thr Ser Thr Tyr Asp Thr Tyr
 85 90 95
 Val Glu Phe Gly Phe Ala Ser Gly Arg Ala Thr Leu Lys Lys Gly Gln
 100 105 110
 Phe Ile Thr Ile Gln Gly Arg Ile Thr Lys Ser Asp Trp Ser Asn Tyr
 115 120 125
 Thr Gln Thr Asn Asp Tyr Ser Phe Asp Ala Ser Ser Ser Thr Pro Val
 130 135 140
 Val Asn Pro Lys Val Thr Gly Tyr Ile Gly Gly Ala Lys Val Leu Gly
 145 150 155 160
 Thr Ala Pro

<210> 3

<211> 573

<212> DNA

<213> Clostridium cellulovorans

<400> 3

ccatgtcagt tgaattctac aactctaaca aatcagcaca aacaaactca attacaccaa 60
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 attattacac aagtgatggt acacaaggac aaactttctg gtgtgaccat gctggtgcat 180
 tattaggaaa tagctatggt gataaacacta gcaaagtgac agcaaacttc gttaaagaaa 240
 cagcaagccc aacatcaacc tatgatacat atgttgaatt tggatttgca agcggacgag 300
 ctactcttaa aaaaggacaa ttataacta ttcaaggaag aataacaaaa tcagactggt 360
 caaactacac tcaaacaat gactattcat ttgatgcaag tagttcaaca ccagttgtaa 420
 atccaaaagt tacaggatat ataggtggag ctaaagtact tggtagcagca ccaggtccag 480
 atgtaccatc ttcaataatt aatcctactt ctgcaacatt tgatcccggg accatggcta 540
 gcatgactgg tggacagcaa atgggtcgga tcc 573

<210> 4

<211> 190

<212> PRT

<213> Clostridium cellulovorans

<400> 4

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Met Ser Val Glu Phe Tyr Asn Ser Asn Lys Ser Ala Gln Thr Asn Ser
1           5           10           15
Ile Thr Pro Ile Ile Lys Ile Thr Asn Thr Ser Asp Ser Asp Leu Asn
20           25           30
Leu Asn Asp Val Lys Val Arg Tyr Tyr Tyr Thr Ser Asp Gly Thr Gln
35           40           45
Gly Gln Thr Phe Trp Cys Asp His Ala Gly Ala Leu Leu Gly Asn Ser
50           55           60
Tyr Val Asp Asn Thr Ser Lys Val Thr Ala Asn Phe Val Lys Glu Thr
65           70           75           80
Ala Ser Pro Thr Ser Thr Tyr Asp Thr Tyr Val Glu Phe Gly Phe Ala
85           90           95
Ser Gly Arg Ala Thr Leu Lys Lys Gly Gln Phe Ile Thr Ile Gln Gly
100          105          110
Arg Ile Thr Lys Ser Asp Trp Ser Asn Tyr Thr Gln Thr Asn Asp Tyr
115          120          125
Ser Phe Asp Ala Ser Ser Ser Thr Pro Val Val Asn Pro Lys Val Thr
130          135          140
Gly Tyr Ile Gly Gly Ala Lys Val Leu Gly Thr Ala Pro Gly Pro Asp
145          150          155          160
Val Pro Ser Ser Ile Ile Asn Pro Thr Ser Ala Thr Phe Asp Pro Gly
165          170          175
Thr Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg Ile
180          185          190

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<210> 5

<211> 1030

<212> DNA

<213> Clostridium cellulovorans

<400> 5

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attattacac aagtgatggt acacaaggac aaactttctg gtgtgaccat gctggtgcat    180
tattaggaaa tagctatggt gataacacta gcaaagtgac agcaaacttc gttaaagaaa    240

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cagcaagccc aacatcaacc tatgatacat atgttgaatt tggatttgca agcggacgag 300
ctactcttaa aaaaggacaa ttataacta ttcaaggaag aataacaaaa tcagactggt 360
caaactacac tcaaacaaat gactattcat ttgatgcaag tagttcaaca ccagttgtaa 420
atccaaaagt tacaggatat ataggtggag ctaaagtact tggtagca caaggtccag 480
atgtaccatc ttcaataatt aatcctactt ctgcaacatt tgatcccggt accatggcag 540
cgacatcatc aatgtcagtt gaattttaca actctaaca atcagcacia acaaactcaa 600
ttacaccaat aatcaaaatt actaacacat ctgacagtga tttaaattta aatgacgtaa 660
aagttagata ttattacaca agtgatggta cacaaggaca aactttctgg tgtgaccatg 720
ctggtgcatt attaggaaat agctatgttg ataacactag caaagtgaca gcaaacttcg 780
ttaaagaaac agcaagccca acatcaacct atgatacata tgttgaattt ggatttgcaa 840
gcgagcagac tactcttaaa aaaggacaat ttataactat tcaaggaaga ataacaaat 900
cagactggtc aaactacact caaacaatg actattcatt tgatgcaagt agttcaacac 960
cagttgtaaa tccaaaagtt acaggatata taggtggagc taaagtactt ggtacagcac 1020
cataggatcc 1030

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<210> 6

<211> 340

<212> PRT

<213> Clostridium cellulovorans

<400> 6

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Met Ser Val Glu Phe Tyr Asn Ser Asn Lys Ser Ala Gln Thr Asn Ser
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Ile Thr Pro Ile Ile Lys Ile Thr Asn Thr Ser Asp Ser Asp Leu Asn
20           25           30
Leu Asn Asp Val Lys Val Arg Tyr Tyr Thr Ser Asp Gly Thr Gln
35           40           45
Gly Gln Thr Phe Trp Cys Asp His Ala Gly Ala Leu Leu Gly Asn Ser
50           55           60
Tyr Val Asp Asn Thr Ser Lys Val Thr Ala Asn Phe Val Lys Glu Thr
65           70           75           80
Ala Ser Pro Thr Ser Thr Tyr Asp Thr Tyr Val Glu Phe Gly Phe Ala
85           90           95
Ser Gly Arg Ala Thr Leu Lys Lys Gly Gln Phe Ile Thr Ile Gln Gly
100          105          110
Arg Ile Thr Lys Ser Asp Trp Ser Asn Tyr Thr Gln Thr Asn Asp Tyr
115          120          125

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Ser Phe Asp Ala Ser Ser Ser Thr Pro Val Val Asn Pro Lys Val Thr
 130 135 140
 Gly Tyr Ile Gly Gly Ala Lys Val Leu Gly Thr Ala Pro Gly Pro Asp
 145 150 155 160
 Val Pro Ser Ser Ile Ile Asn Pro Thr Ser Ala Thr Phe Asp Pro Gly
 165 170 175
 Thr Met Ala Ala Thr Ser Ser Met Ser Val Glu Phe Tyr Asn Ser Asn
 180 185 190
 Lys Ser Ala Gln Thr Asn Ser Ile Thr Pro Ile Ile Lys Ile Thr Asn
 195 200 205
 Thr Ser Asp Ser Asp Leu Asn Leu Asn Asp Val Lys Val Arg Tyr Tyr
 210 215 220
 Tyr Thr Ser Asp Gly Thr Gln Gly Gln Thr Phe Trp Cys Asp His Ala
 225 230 235 240
 Gly Ala Leu Leu Gly Asn Ser Tyr Val Asp Asn Thr Ser Lys Val Thr
 245 250 255
 Ala Asn Phe Val Lys Glu Thr Ala Ser Pro Thr Ser Thr Tyr Asp Thr
 260 265 270
 Tyr Val Glu Phe Gly Phe Ala Ser Gly Arg Ala Thr Leu Lys Lys Gly
 275 280 285
 Gln Phe Ile Thr Ile Gln Gly Arg Ile Thr Lys Ser Asp Trp Ser Asn
 290 295 300
 Tyr Thr Gln Thr Asn Asp Tyr Ser Phe Asp Ala Ser Ser Ser Thr Pro
 305 310 315 320
 Val Val Asn Pro Lys Val Thr Gly Tyr Ile Gly Gly Ala Lys Val Leu
 325 330 335
 Gly Thr Ala Pro
 340

<210> 7

<211> 1288

<212> DNA

<213> recombinant nucleotide sequence

<220>

<221> misc_feature

<222> (3)..(791)

<223> pRIT2T cloning vector

<220>

<221> misc_feature

<222> (795)..(1280)

<223> from cbpA gene

<400> 7

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gccttaaaga tgatccaagc caaagtgcta acgttttagg tgaagctcaa aaacttaatg      120
actctcaagc tccaaaagct gatgcgcaac aaaataactt caacaaagat caacaaagcg      180
ccttctatga aatcttgaac atgcctaact taaacgaagc gcaacgtaac ggcttcattc      240
aaagtcttaa agacgaccca agccaaagca ctaacgtttt aggtgaagct aaaaaattaa      300
acgaatctca agcaccgaaa gctgataaca atttcaacaa agaacaacaa aatgctttct      360
atgaaatctt gaatatgcct aacttaaacy aagaacaacy caatggtttc atccaaagct      420
taaaagatga cccaagccaa agtgctaacc tattgtcaga agctaaaaag ttaaatgaat      480
ctcaagcacc gaaagcggat aacaaattca acaaagaaca acaaaatgct ttctatgaaa      540
tcttacattht acctaactta aacgaagaac aacgcaatgg tttcatccaa agcctaaaag      600
atgacccaag ccaaagcgct aaccttttag cagaagctaa aaagctaaat gatgctcaag      660
caccaaaagc tgacaacaaa ttcaacaaag aacaacaaaa tgctttctat gaaatthtac      720
atthaccta a cttaactgaa gaacaacgta acggcttcat ccaaagcctt aaagacgatc      780
cggggaattc catggcagcg acatcatcaa tgtcagttga atthttacaac tctaacaat      840
cagcacaac aaactcaatt acaccaataa tcaaaattac taacacatct gacagtgatt      900
taaattthaa tgacgtaaaa gttagatatt attacacaag tgatggtaca caaggacaaa      960
ctthctggtg tgaccatgct ggtgcattat taggaaatag ctatgttgat aactactagca     1020
aagtgacagc aaacttcgtht aaagaaacag caagcccaac atcaacctat gatacatatg     1080
ttgaatttg atthtgcaagc ggacgagcta ctcttaaaaa aggacaattht ataactattht     1140
aaggaagaat aacaaaatca gactggtcaa actacactca aacaaatgac tthtcatttg     1200
atgcaagtag ttcaacacca gttgtaaatc caaaagttac aggatatata ggtggagcta     1260
aagtacttgg tacagcacca taggatcc                                     1288

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<210> 8

<211> 426

<212> PRT

<213> recombinant protein sequence

<220>

<221> misc_feature

<222> (1)..(263)

<223> protein A from cloning vector

<220>

<221> misc_feature

<222> (265)..(426)

<223> CBPA

<400> 8

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Met Glu Gln Arg Ile Thr Leu Lys Glu Ala Trp Asp Gln Arg Asn Gly
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Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln Ser Ala Asn Val Leu
             20             25             30
Gly Glu Ala Gln Lys Leu Asn Asp Ser Gln Ala Pro Lys Ala Asp Ala
             35             40             45
Gln Gln Asn Asn Phe Asn Lys Asp Gln Gln Ser Ala Phe Tyr Glu Ile
             50             55             60
Leu Asn Met Pro Asn Leu Asn Glu Ala Gln Arg Asn Gly Phe Ile Gln
65             70             75             80
Ser Leu Lys Asp Asp Pro Ser Gln Ser Thr Asn Val Leu Gly Glu Ala
             85             90             95
Lys Lys Leu Asn Glu Ser Gln Ala Pro Lys Ala Asp Asn Asn Phe Asn
             100            105            110
Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu Asn Met Pro Asn Leu
             115            120            125
Asn Glu Glu Gln Arg Asn Gly Phe Ile Gln Ser Leu Lys Asp Asp Pro
             130            135            140
Ser Gln Ser Ala Asn Leu Leu Ser Glu Ala Lys Lys Leu Asn Glu Ser
145            150            155            160
Gln Ala Pro Lys Ala Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala
             165            170            175
Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln Arg Asn
             180            185            190
Gly Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln Ser Ala Asn Leu
             195            200            205
Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala Gln Ala Pro Lys Ala Asp
             210            215            220
Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu His
225            230            235            240

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Leu Pro Asn Leu Thr Glu Glu Gln Arg Asn Gly Phe Ile Gln Ser Leu
 245 250 255
 Lys Asp Asp Pro Gly Asn Ser Met Ala Ala Thr Ser Ser Met Ser Val
 260 265 270
 Glu Phe Tyr Asn Ser Asn Lys Ser Ala Gln Thr Asn Ser Ile Thr Pro
 275 280 285
 Ile Ile Lys Ile Thr Asn Thr Ser Asp Ser Asp Leu Asn Leu Asn Asp
 290 295 300
 Val Lys Val Arg Tyr Tyr Tyr Thr Ser Asp Gly Thr Gln Gly Gln Thr
 305 310 315 320
 Phe Trp Cys Asp His Ala Gly Ala Leu Leu Gly Asn Ser Tyr Val Asp
 325 330 335
 Asn Thr Ser Lys Val Thr Ala Asn Phe Val Lys Glu Thr Ala Ser Pro
 340 345 350
 Thr Ser Thr Tyr Asp Thr Tyr Val Glu Phe Gly Phe Ala Ser Gly Arg
 355 360 365
 Ala Thr Leu Lys Lys Gly Gln Phe Ile Thr Ile Gln Gly Arg Ile Thr
 370 375 380
 Lys Ser Asp Trp Ser Asn Tyr Thr Gln Thr Asn Asp Tyr Ser Phe Asp
 385 390 395 400
 Ala Ser Ser Ser Thr Pro Val Val Asn Pro Lys Val Thr Gly Tyr Ile
 405 410 415
 Gly Gly Ala Lys Val Leu Gly Thr Ala Pro
 420 425

<210> 9

<211> 984

<212> DNA

<213> recombinant nucleotide sequence

<220>

<221> misc_feature

<222> (68)..(624)

<223> taken from Clostridium cellulovorans

<220>

<221> misc_feature

<222> (652)..(981)

<223> taken from bovine

<400> 9

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aactctaaca aatcagcaca aacaaactca attacaccaa taatcaaaat tactaacaca      180
tctgacagtg atttaaattt aaatgacgta aaagttagat attattacac aagtgatggt      240
acacaaggac aaactttctg gtgtgaccat gctggtgcat tattaggaaa tagctatggt      300
gataacacta gcaaagtgc agcaaacttc gttaaagaaa cagcaagccc aacatcaacc      360
tatgatacat atgttggaatt tggatttgca agcggacgag ctactcttaa aaaaggacaa      420
tttataacta ttcaaggaag aataacaaaa tcagactggt caaactacac tcaaacaat      480
gactattcat ttgatgcaag tagttcaaca ccagttgtaa atccaaaagt tacaggatat      540
ataggtggag ctaaagtact tggtagagca ccaggtccag atgtaccatc ttcaataatt      600
aatcctactt ctgcaacatt tgatccccgt accatggggtc ctctcctctg aagcacttcc      660
gctgccagca gctccaacta ttgcaaccag atgatgaaga gccggaacct gaccaaagat      720
cgatgcaagc cagtgaacac ctttgtgcac gagtccctgg ctgatgtcca ggccgtgtgc      780
tcccagaaaa atgttgctg caagaatggg cagaccaatt gctaccagag ctactccacc      840
atgagcatca ccgactgccg tgagaccggc agctccaagt accccaactg tgcctacaag      900
accaccaggg cgaataaaca catcattgtg gcttgtgagg gaaacccgta cgtgccagtc      960
cacttcgacg cttcagtgtg gatc                                          984

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<210> 10

<211> 326

<212> PRT

<213> recombinant protein sequence

<220>

<221> misc_feature

<222> (30)..(208)

<223> taken from Clostridium cellulovorans

<220>

<221> misc_feature

<222> (226)..(326)

<223> taken from bovine

<400> 10

His Met Lys Glu Thr Ala Ala Ala Lys Phe Glu Arg Gln His Met Asp

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Ser Pro Asp Leu Gly Thr Leu Val Pro Arg Gly Ser Met Ala Ala Thr

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Ser Ser Met Ser Val Glu Phe Tyr Asn Ser Asn Lys Ser Ala Gln Thr		
35	40	45
Asn Ser Ile Thr Pro Ile Ile Lys Ile Thr Asn Thr Ser Asp Ser Asp		
50	55	60
Leu Asn Leu Asn Asp Val Lys Val Arg Tyr Tyr Tyr Thr Ser Asp Gly		
65	70	75
Thr Gln Gly Gln Thr Phe Trp Cys Asp His Ala Gly Ala Leu Leu Gly		
85	90	95
Asn Ser Tyr Val Asp Asn Thr Ser Lys Val Thr Ala Asn Phe Val Lys		
100	105	110
Glu Thr Ala Ser Pro Thr Ser Thr Tyr Asp Thr Tyr Val Glu Phe Gly		
115	120	125
Phe Ala Ser Gly Arg Ala Thr Leu Lys Lys Gly Gln Phe Ile Thr Ile		
130	135	140
Gln Gly Arg Ile Thr Lys Ser Asp Trp Ser Asn Tyr Thr Gln Thr Asn		
145	150	155
Asp Tyr Ser Phe Asp Ala Ser Ser Ser Thr Pro Val Val Asn Pro Lys		
165	170	175
Val Thr Gly Tyr Ile Gly Gly Ala Lys Val Leu Gly Thr Ala Pro Gly		
180	185	190
Pro Asp Val Pro Ser Ser Ile Ile Asn Pro Thr Ser Ala Thr Phe Asp		
195	200	205
Pro Gly Thr Met Gly Pro Pro Pro Gly Ser Thr Ser Ala Ala Ser Ser		
210	215	220
Ser Asn Tyr Cys Asn Gln Met Met Lys Ser Arg Asn Leu Thr Lys Asp		
225	230	235
Arg Cys Lys Pro Val Asn Thr Phe Val His Glu Ser Leu Ala Asp Val		
245	250	255
Gln Ala Val Cys Ser Gln Lys Asn Val Ala Cys Lys Asn Gly Gln Thr		
260	265	270
Asn Cys Tyr Gln Ser Tyr Ser Thr Met Ser Ile Thr Asp Cys Arg Glu		
275	280	285
Thr Gly Ser Ser Lys Tyr Pro Asn Cys Ala Tyr Lys Thr Thr Gln Ala		
290	295	300
Asn Lys His Ile Ile Val Ala Cys Glu Gly Asn Pro Tyr Val Pro Val		

305 310 315 320

His Phe Asp Ala Ser Val

 325

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<210> 11
<211> 24
<212> DNA
<213> Synthetic Oligonucleotide;
<400> 11
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<210> 12
<211> 18
<212> DNA
<213> Synthetic Oligonucleotide;
<400> 12
gggggatcct atggtgct
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<210> 13
<211> 22
<212> DNA
<213> Synthetic Oligonucleotide;
<400> 13

ggggggtacc atggaacaac gc
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